WOOD-BORING COLEOPTERA AND ASSOCIATED INSECTS REARED FROM *ACACIA DEALBATA* LINK IN TASMANIA

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Abstract

Thirty two insect taxa were reared from dead or dying *Acacia dealbata* trees from three sites in Tasmania. Sixteen new records are noted for *A. dealbata* in Tasmania and fourteen for Australia. The Cerambycidae was the most diverse family of wood-borers in this study demonstrating their importance as secondary insects influencing mortality and decomposition of *A. dealbata*. The families Bostrychidae and Curculionidae were also numerically important, though less diverse. Buprestidae and Lyctidae occurred in small numbers. Predators of the coleopteran families Cleridae and Trogositidae and parasitoids of the hymenopteran families Aulacidae, Braconidae and Orussidae were also reared from *A. dealbata* timber. Some cerambycid species are distributed within trees according to a positive relationship between beetle size and stem diameter.

Introduction

A. dealbata is a widespread and locally abundant wattle which frequently occurs in dense young stands following fire, and several papers have been published recently listing emergence records of wood-boring Coleoptera (van den Berg, 1982; Webb, 1987, 1990).

Observation of stands of debilitated *A. dealbata* regeneration indicates a health decline downwards from the crown, often following severe defoliation by the fireblight beetle *Pyrgoides orphana* (Erichson) (Chrysomelidae) (Elliott, 1978). Dead twigs, less than 0.5 cm diameter, often contain cerambycid larvae while the main stem is green and sprouting shoots. Attack by the larger cerambycids, especially *Anicita* spp., occurs most frequently in the second year of decline often resulting in the death of the tree. Subsequent attack by other wood-borers lead to rapid tree fall and decomposition of timber on the forest floor.

A. dealbata has excellent growth rates and fibre length quantities as a pulp timber and would be grown commercially in Tasmania if defoliation by *P. orphana* could be reduced.

There have not been any previous rearing studies of timber insects of *A. dealbata* carried out in Tasmania. The number of new records reflects the paucity of information on the relationships of many timber insects and their hosts.

Collection sites and methods

Timber sections of recently dead *A. dealbata* were collected in mid winter (July/August) of 1984 (6 trees) and 1985 (3 trees) from three sites in Tasmania. Table 1 lists the sites, heights and basal diameters of the nine trees collected.

Trees sampled at Woodsdale were ringbarked 5 cm above ground level in August 1983 and collected the following winter. Samples from other sites

Table 1. Tasmanian collection sites of *A. dealbata* and tree measurements.

Site	1984			1985		
	Number of trees	Hts (m)	DOB* (cm)	Number of trees	Hts (m)	DOB* (cm)
Tower Hill (North East)	2	5.4 5.2	4.8 4.5	2	5.0 4.7	3.8 3.9
Branch's Creek (North)	1	7.5	4.5	1	5.9	5.0
Woodsdale (East)	3	2.4 2.8 3.1	3.1 3.5 3.3	No observations		

*DOB Diameter over bark taken at 30 cm above ground level.

were obtained from trees already dead for one year or dying at the time of observation.

All trees were sawn into 50 cm lengths which were then placed, either individually or in groups of similar diameter, into 1 mm wire mesh cages in a laboratory and maintained at ambient temperature for three years. The cages were checked weekly during the summer months and monthly for the rest of the year.

The emergence of all Coleoptera and associated predators and parasitoids was noted and reference specimens prepared for identification.

Measurement of emergence hole width, at the point of greatest diameter, were made for known species of cerambycids using vernier callipers. By measuring fresh emergence holes each week it was possible to correlate the size of emergence holes with particular species. Mid-stem diameters were taken on timber samples held in individual cages to correlate with species distribution in the trees.

Results

A number of wood-boring beetles and associated insects which have not been previously recorded from *A. dealbata* were collected as well as some known species. Table 2 lists the insects reared from each site and an indication of the numbers of each species.

A total of fifteen cerambycid species were reared from *A. dealbata* timber collected from three sites in Tasmania. Only three of those species, *B. signiferum*, *I. exilis* and *P. plumula* were common to all sites. These species occurred in large numbers and clearly have a statewide distribution. *B. signiferum* has been reared in high numbers from *A. dealbata* timber in NSW by Webb (1990).

Table 2. Insects reared from *Acacia dealbata* 1985-1987.

Species	Number of Specimens	Site *	Status **
COLEOPTERA			
Bostrychidae			
Xylobosca bispinosa (Macleay)	200+	3	-
Xylobosca canina (Blackburn)	5	3	T
Buprestidae			
Cisseis sp.	4	3	T, A
Melobasis purpurescens Fabricius	9	3	T, A
Cerambycidae			
Ambeodontus pilosus (Pascoe)	3	2	T, A
Amphirhoe decora (Newman)	2	3	T, A
Ancita crocogaster (Boisduval)	23	1, 2	T
Ancita marginicollis (Boisduval)	35	2, 3	-
Aphneope quadrimaculator Poll	1	2	T, A
Bethelium signiferum (Newman)	107	1,2,3	-
Illaena exilis Erichson	122	1,2,3	-
Mecynopus cothurnatus Erichson	18	1,2	T, A
Notoceresium sp.	6	1	-
Phacodes personatus Erichson	2	3	-
Probatodes plumula (Newman)	141	1,2,3	-
Rhinophthalmus nasutus (Shuckard)	4	3	-
Stenoderus suturalis (Olivier)	1	1	-
Syllitus grammicus (Newman)	8	3	-
Zoedia divisa Pascoe	5	1,3	-
Cleridae (predators)			
Blackburniella hilaris (Westwood)	11	1,3	T, A
Eleale sp.	2	1,2	
Curculionidae			
Belus bidentatus (Donovan)	5	3	-
Belus bimaculatus Pascoe	9	3	T, A
Orthorhinus cylindrirostris (Fabricius)	8	3	-
Pachyura cinerea (Blanchard)	2	3	T, A
Pentamimus australis (Erichson)	31	1	T, A
Saccolaemus sp.	200	3	-
Lyctidae			
Trogoxylon ypsilon Lesne	5	3	T, A
Trogossitidae (predator)			
Lepidopteryx decorata (Erichson)	3	1	T, A
HYMENOPTERA (parasitoids)			
Aulacidae			
Aulacostethus variegatus (Shuckard)	8	2,3	-
Braconidae			
Doryctes sp.	15	3	T, A
Orussidae			
Orussobaius minutus Benson	12	3	T, A

* Site: 1. Tower Hill; 2. Branch's Creek; 3. Woodsdale.

**Status T - not previously documented from *A. dealbata* in Tasmania

A - not previously documented from *A. dealbata* in Australia.

The lyctid *T. ypsilon* emerged only from 30 cm length of Woodsdale timber.

Large numbers of the bostrychid *X. bispinosa* and the curculionid *Saccolaemus* sp. emerged from all timber sections of Woodsdale material but were absent from the northern Tasmanian sites.

None of the predators or parasitoids could be linked directly with the other species present in the timber however all, except *Orussobaius minutus*, have been previously found attacking cerambycid larvae in eucalypts (Bashford, unpub.). *Orussobaius wilsoni* has been considered as a possible parasite of the buprestid *Melobasis purpurascens* by Riek (1955).

Emergence hole diameters for nine cerambycid species are listed in Table 3 while Figure 1 compares the range, means and standard error of those diameters with the timber samples from which they emerged.

Table 3. Emergence hole diameters of some cerambycids from *A. dealbata*.

Species	Diameter (mm)		
	Range	Mean	
Ancita crocogaster	3.8 - 5.0	4.2	n=13
Ancita marginicollis	2.6 - 3.7	3.3	n=10
Bethelium signiferum	1.6 - 2.3	2.2	n=36
Illaena exilis	1.3 - 2.1	1.9	n=25
Mecynopus cothurnatus	1.8 - 2.7	2.4	n=11
Notoceresium sp.	1.7 - 1.8	1.8	n=2
Probatodes plumula	2.2 - 2.8	2.6	n=9
Stenoderus suturalis	3.5	3.5	n=1
Zoedia divisa	2.6	2.6	n=1

An attempt has been made to correlate stem diameter with attack by individual species along the stem length. The results show that some species are confined to defined stem widths regardless of other material to them whilst others are generalistic, attacking throughout the tree stem length.

The small cerambycids *I. exilis*, *B. signiferum* and *Notoceresium* sp. were only found from branches of less than 1.7 cm diameter. The two *Ancita* species were restricted to stem diameters of more than 3.7 cm diameter. The other cerambycids were distributed throughout the range of stem diameters as were the buprestids and the bostrychid *Xylobosca bispinosa*.

T-tests for each pair of species are given in Table 4. These t-tests used the standard deviation of each species separately rather than a pooled estimate from an ANOVA because of significant heterogeneity of variances ($P=<0.001$) between species which could not be corrected by logarithmic or square root transformations of the size data. Degrees of freedom of the t-tests were calculated using Satterthwaite's approximation where variances were unequal. (SAS/STAT™ User's Guide, 1988).

The total cerambycid emergences over two years, from the Branch's Creek and Tower Hill samples are illustrated in Figure 2. Stem diameters were taken for only some Woodsdale stems so this site is not included. A total of

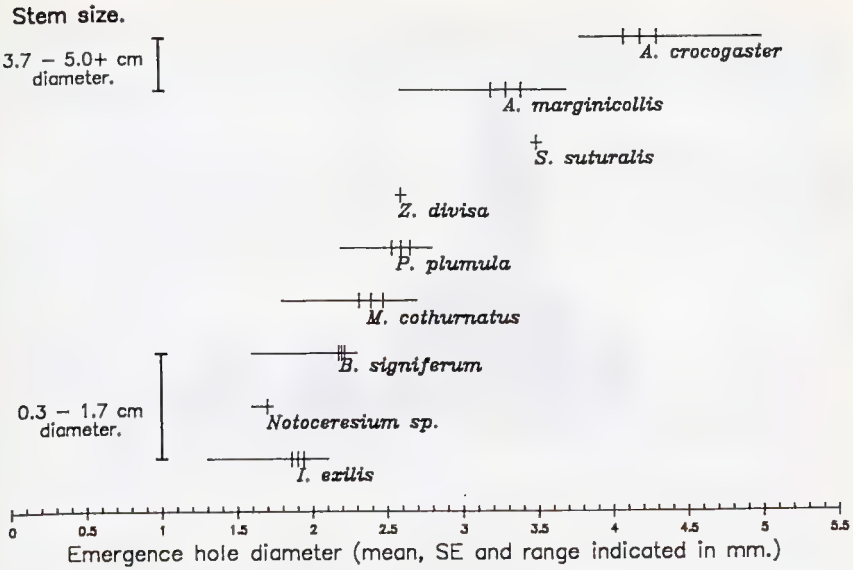

Figure 1. Diameter of emergence holes of some cerambycids emerging from *A. dealbata*.

212 adults emerged from Tower Hill sections of surface area 1.54 m^2, and 266 adults from 1.06 m^2 of Branch Creek material.

Emergence of all the wood-borers occurred between late September and mid-April with a peak in the mid summer months. There was no cerambycid emergence in the third year of caging. All species of cerambycids emerged during a two year period, with only three species, *B. signiferum*, *I. exilis* and *Notoceresium* sp. having a higher second year emergence. It is unlikely that higher emergence in the second year was due to reinfestation since the cages were emptied on a weekly basis but rather that reduced timber moisture levels slowed larval development.

Table 4. Significance of individual cerambycid species emergence hole diameters.

Species	SE	A.m.	B.s.	I.e.	M.c.	P.p.
A. crocogaster	0.1132	***	***	***	***	***
A. marginicollis	0.1054	-	***	***	***	***
B. signiferum	0.0239		-	***	**	***
I. exilis	0.0416			-	***	***
M. cothurnatus	0.0809				-	NS
P. plumula	0.0645					-

*** $P < 0.0002$

** $P = 0.035$

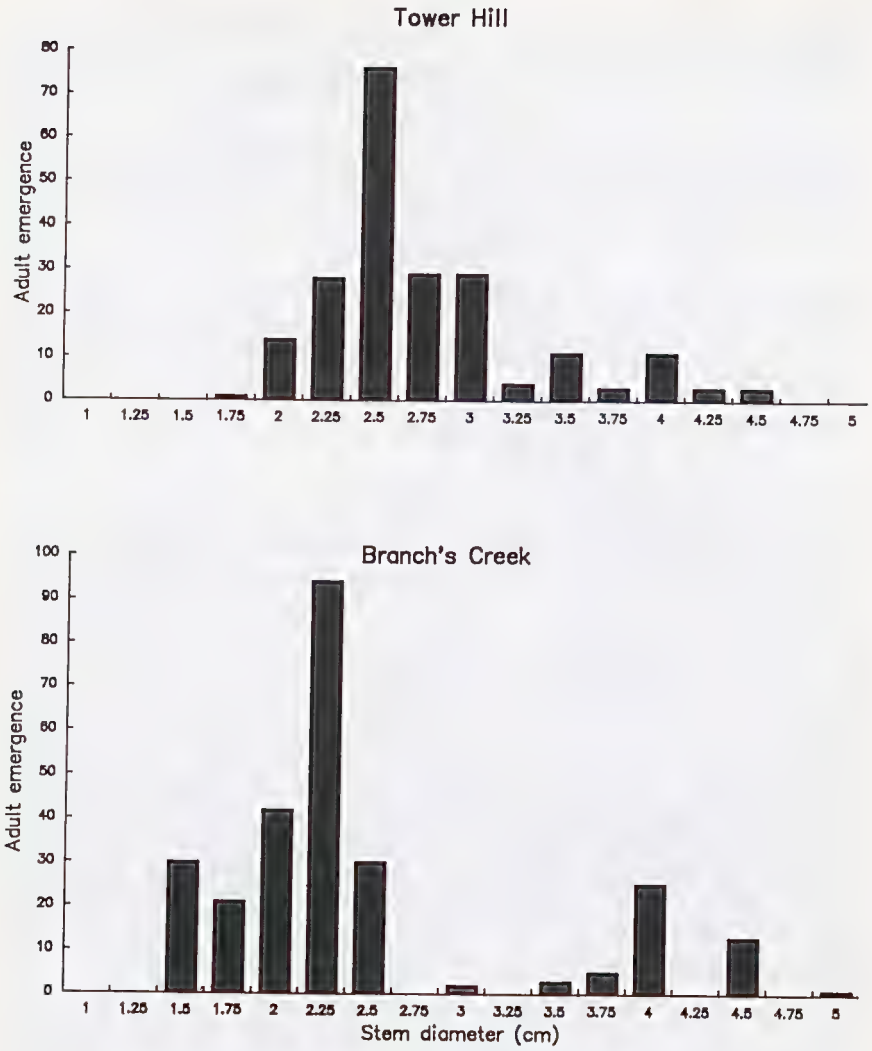

Figure 2. Emergence of cerambycids from *A. dealbata* timber.

Discussion

The pattern of debilitation and subsequent death of patches of young *A. dealbata* has been outlined. Predisposing defoliation by the chrysomelid *Pyrgoides orphana* is rapidly followed by aggressive attack of the smaller twigs and branches by several species of small cerambycids. As further decline occurs the larger cerambycid species, such as *Ancita* spp., and the weevil *Saccolaemus* sp. are able to establish resulting in the death of the tree.

Freshly killed trees are then utilised by a range of timber boring insects. Patches of dead saplings are frequently broken and shredded by the yellow-tailed black cockatoo *Calyptorhynchus funereus* searching for large wood inhabiting larvae.

Management control of the fireblight beetle, *P. orphana*, would also largely prevent successful infestation by many of the wood boring Coleoptera reared in this study. This would enable a valuable timber resource to be added to the plantation inventory and the potential of *A. dealbata* as a pulp and veneer timber to be realised.

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